

IES Newsletter

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Director's Note

On an display created several years ago, a world map is studded with red and green pins showing Institute of Ecosystem Studies' field research sites and sites of collaboration. While a major focus of IES research and education programs is North Temperate ecosystems, global issues are equally important and we value the opportunity to work with colleagues in South America, Europe, the Mid-East, Far East and South Pacific.

IES adjunct scientist Dr. Moshe Shachak is an ecologist at the Jacob Blaustein Institute for Desert Research in Israel's Negev Desert. For close to a decade he and Dr. Clive Jones have been collaborating on studies of how one of the simplest of natural interrelationships — a rock, a lichen and a snail — contributes to the Negev ecosystem. Now, Dr. Shachak and a group of Israeli ecologists are developing ways to help increase plant productivity in the desert. The cover story of this IES NEWSLETTER explains the project and the collaborative role played by IES scientists.

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IES and Israeli Scientists Collaborate

In Israel, where the land area is roughly one-half desert, there is tremendous interest in developing ways to make the best use of arid soils. The Negev Desert fills the southern part of the country, and it is there that a group of scientists at the Jacob Blaustein Institute for Desert Research in Sede Boker, in collaboration with Institute of Ecosystem Studies ecologists, is developing a project to try to do just that.

No more than 200 mm (just under 8 inches) of rain fall on the Negev Desert each year, much less than is required to support the growth of forests. The Savannization Project — an attempt to increase the productivity and biodiversity of the Negev — is sponsored by the Jewish National Fund, a private organization that raises funds worldwide to help plant forests throughout Israel. In areas where there is already some natural vegetation, trees are being planted behind dikes constructed to trap runoff water. Between these dikes, there will be areas that resemble a savanna, with tall woody vegetation, shrubs and herbaceous plants. (A savanna is a type of biogeographical region, or biome, that typically has drought-resistant vegetation dominated by grasses with scattered tall trees. Dr. Steward Pickett, one of the IES collaborators with the Savannization Project, acknowledges that the new vegetation areas in Israel will lack the characteristic grasses, but says that otherwise they will resemble savannas.) Some of the newly planted trees are fruit and nut producers, to boost the agricultural potential of the land.

Drs. Moshe Shachak, Bertrand Boeken and Eli Zaady are scientists at the Jacob Blaustein Institute for Desert Research and form the ecological nucleus of a research team working on this large landscape development project. It is rare for a development agency to be interested in the ecological aspects of a project, but the Jewish National Fund recognizes the need for careful study and observation of the altered-desert ecosystem. The Savannization Project combines fundamental and applied ecological research with ecological landscape development. The research focuses on processes involved in desertification and the management principles necessary to counteract them, as well as on biological productivity and diversity and ecosystem functions.

Dr. Shachak, who is also an adjunct scientist at the Institute of Ecosystem Studies, deals with integrative and theoretical aspects of the Savannization Project, as well as with ecosystem processes. With a background in animal population ecology, he also studies the involvement of invertebrates in the system. Dr. Boeken, whose background is in plant ecology, worked at the Institute a few years ago as a Post-doctoral Research Associate. In the Savannization Project he studies productivity and biological diversity, and vegetation and patch dynamics. Dr. Zaady, a soil microbial ecologist, has worked at IES as part of his postdoctoral work with the Institute for Desert Research. His involvement in the Savannization Project is with

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At IES, l. to r., Israeli ecologists Dr. Eli Zaady, Dr. Bertrand Boeken, Eaton Fellow Ludmilla Shechter and Dr. Moshe Shachak

Invaders from Your Landscape?

by William S. Montgomery, Program Leader, Continuing Education

In his classic *Sand County Almanac*, Aldo Leopold theorized about an "isolationist" mindset toward land:

We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect. There is no other way for land to survive the impact of mechanized man, nor for us to reap from it the aesthetic harvest it is capable, under science, of contributing to culture. That land is a community is the basic concept of ecology, but that land is to be loved and respected is an extension of ethics.

Publicity in recent years has created a general awareness that actions on a site can have implications for many miles beyond the site's boundaries. For example, pesticides used on landscape plants or turf can affect ground water that ultimately flows into larger bodies of water.

Less apparent is awareness of the widespread implications of the plants comprising a landscape. Certain non-native plants are proving to be incompatible with the Northeast landscape and are running rampant. Berries or seeds from these plants, generally called "invasive exotics", are carried by birds, wind or water into woodlands or disturbed soil, where the exotics outcompete and eventually replace native trees, shrubs and herbaceous perennials. Some research has indicated that the exotics outcompete by leafing out earlier in the season than natives and retaining leaves longer in the fall. The result is not only a dramatic, sometimes alarming alteration to the visual landscape, but more importantly a disturbance of the ecosystem with permanent implications for the native plants and dependent wildlife. Stands of a single exotic species may impoverish a whole dependent chain of native organisms.

What are these destructive invaders? One of those most commonly seen in this region is **purple loosestrife** (*Lythrum salicaria*), an arrival from Europe. This plant has spread alarmingly in wetlands and in places has entirely replaced useful, native plants such as cattails. Amazingly, some nurseries continue to sell this plant as an ornamental garden perennial.

Of greater concern is a group of invasive exotics that are among the most popular for

planted landscapes. Apparently their destructive nature is not widely recognized, as they continue to be recommended by many landscape professionals (e.g., landscape architects and designers, nurserymen, authors, lecturers) and planted by private contractors and highway departments, among others. Most popular among the invasive exotics are:

Norway maple (*Acer platanoides*) - This tree is one of the most widely planted along streets and in other landscapes. It is also extremely invasive ... one of the most serious threats to native plants in northeastern forests. Not only does its dense foliage shade and inhibit ground layer vegetation from early spring through late fall, but it is strongly allelopathic: the tree prevents the growth of other plant species through the release of toxic substances to the soil. Ultimately, an entire woodland will be transformed to Norway maple, and under the canopy will be bare ground that is subject to erosion.



Above, **burning bush** (*Euonymus alatus*) - Native to the Far East, this shrub is extensively used, sometimes in mass plantings, because of its brilliant red fall color. Now it frequently can be seen invading woodland edges, including sections of Route 44A east of the Institute. This drawing illustrates how burning bush (in black) often grows, becoming established at forest edges and in forest clearings.

Russian olive (*Elaeagnus angustifolia*, a small tree) and **autumn olive** (*E. umbellatus*, a shrub) - Light gray-green foliage, sandy soil adaptation and fruit that attracts birds seem to be the main appeals of these plants. These and other invasive species are sometimes defended because of their wildlife value. This view, however, is very short-sighted: the invasive species are likely

to be abundant for a long time, but the continued loss of habitat diversity is devastating to birds and other wildlife. Autumn olive has been planted extensively along highways — Interstate 84 in western Connecticut for example — where, after a few years, the highly invasive nature can be observed.

What should you do to help reduce invasions and support native plant communities? Strong recommendations are:

- **Do not purchase or plant** any of the species described or listed in the box at the top of the next page.
- **Remove or have removed** any of these plants that exist on property you own or influence.
- **Warn others**, including landscape professionals and municipal tree departments about the destructive nature of these plants.

What are other plant options? Fortunately, hundreds of desirable, even superior, alternatives are commonly available. Clearly, the plants of choice are the natives — preferably those indigenous within an 80-kilometer (50-mile) radius, but within North America at least. Native plants are beautiful, generally in harmony with the surrounding landscape, hardy (they *belong* here!) ... and contributors to ecological restoration. Also, although native plants continue to be substantially underused by most landscape professionals, their appeal in the landscape is considerable. For example, the brilliant red fall color prized in the aforementioned, highly-

invasive burning bush can be achieved with native shrubs such as highbush blueberry (*Vaccinium corymbosum*) or shining sumac (*Rhus copallina*). Other than native species, acceptable are hundreds of exotic (non-native) plants that exist compatibly (i.e., they are not invasive) in our region.

In the Institute's Continuing Education Program, ecological leadership is the foremost goal. Education about the impact of plants in ecosystems is important in achieving this goal, and is emphasized particularly in courses leading to an IES Certificate in Landscape Design or Certificate in Gardening. Many of these courses now teach the dangers of invasive exotics and advocate the use of native plants. For example, a new offering,

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Invaders, *continued*

Ecological Landscape Design: Successful Design with Native Plants (next scheduled for fall 1994), is now a requirement for earning a Certificate in Landscape Design.

As a fitting conclusion to this discussion of plants in the landscape, we return to Aldo Leopold:

A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise.

References

Leopold, Aldo. *A Sand County Almanac*. New York: Ballantine Books, 1984.
Parnall, Ruth. "Plant Bullies Can Be Endangering Species". *Women in Natural Resources*, Vol. 13, No. 2 (1991), 21-22.
Sauer, Leslie. "Bring Back the Forests". *Wildflower* (Summer 1992), 27-34.

These invasive exotics are somewhat less popular than those described on the previous page, but are commonly available and frequently planted:

Trees

sycamore maple	<i>Acer pseudoplatanus</i>
white mulberry	<i>Morus alba</i>
princess tree	<i>Paulownia tomentosa</i>
white cottonwood	<i>Populus alba</i>

Shrubs

Japanese barberry	<i>Berberis thunbergii</i>
amur honeysuckle	<i>Lonicera maackii</i>
morrow honeysuckle	<i>Lonicera morrowii</i>
tartarian honeysuckle	<i>Lonicera tatarica</i>
blunt-leaved privet	<i>Ligustrum obtusifolium</i>
smooth buckthorn	<i>Rhamnus cathartica</i>
shining buckthorn	<i>Rhamnus frangula</i>
multiflora rose	<i>Rosa multiflora</i>
rugose rose	<i>Rosa rugosa</i>

Vines

porcelain berry	<i>Ampelopsis brevipedunculata</i>
oriental bittersweet	<i>Celastrus orbiculata</i>
Japanese honeysuckle	<i>Lonicera japonica</i>
silver fleece vine	<i>Polygonum aubertii</i>
kudzu	<i>Pueraria lobata</i>
Japanese wisteria	<i>Wisteria floribunda</i>

Herbaceous perennials

Japanese knotweed	<i>Polygonum cuspidatum</i>
yellow flag iris	<i>Iris pseudacorus</i>

Collaboration, *from page 1*

microbial soil communities and soil crust* communities (cyanobacteria, algae, mosses and lichens), both of which are important controllers of nutrient cycling and resource flows within the landscape.

The Institute of Ecosystem Studies is a leader in ecosystem function research, so in fall 1993 Drs. Shachak, Boeken and Zaady visited IES to collaborate with ecologists whose areas of expertise complemented their own research concerns. Their colleagues in the project, in addition to Dr. Pickett whose research deals with vegetation dynamics and succession, are: Dr. Charles Canham, patchiness and plant regeneration; Dr. Peter Groffman, soil microbial ecology and soil crust; Dr. Clive Jones, rock-eating snails of the Negev Desert; Dr. Gary Lovett, nutrient flux; and Dr. Richard Ostfeld, burrowing invertebrates and small mammals (see box). Also during their visit to the Institute, the Israeli team met with Dr. Juan Armesto, an IES adjunct scientist at the Universidad de Chile, who sees the potential of the savannization model in increasing the productivity of some Chilean desert areas.

Collaboration continues. Dr. Pickett has just returned from a trip to Israel where he visited Savannization Project sites, evaluated current research results and helped plan further work on the succession of the soil crusts and their interaction with

disturbance and higher plants. While in Israel he also presented the conceptual basis of the project to an international meeting on "Development at the Frontier".

Eaton Fellowship for Savannization Project Technician

Ms. Ludmilla Shechter, a research technician with the Water Resources Center at the Jacob Blaustein Institute for Desert Research, is also involved in the Savannization Project. As an Eaton Fellow, she spent October 1993 at IES. Her expertise is in chemical analysis of water,

soil and dust, and she gained practical experience in the Institute's analytical laboratories with laboratory manager and forest ecologist Dr. Kathleen Weathers and research assistants Denise Schmidt, Carmen Santos and Meg Stapleton. In addition, working with Dr. Lovett, she used the Institute's carbon-nitrogen analyzer to measure the nitrogen content of dust samples taken from Negev Desert study sites.

In moist ecosystems most nitrogen is cycled below ground, but in deserts dead organic material falls to the ground where it crumbles and is blown away as dust. How much nitrogen — a nutrient required for growth — is in that blowing desert dust, and how is it taken up by desert vegetation? Dr. Shachak set up dust collectors in the open as well as under shrubs, and it is those samples that Ms. Shechter analyzed at IES. Her findings will contribute to data that are making the Savannization Project a model for ecological landscape development.

The John S. Eaton Fellowship in Laboratory Sciences was established in 1988 following the death of John Eaton, forest ecologist and IES laboratory manager. The fellowship is supported by donations from friends and colleagues. Eaton Fellows do research at the Institute, learn state-of-the-art analytical techniques and collaborate with IES staff. Their experiences provide them with the opportunity to perpetuate the insight and values that John Eaton brought to ecological science. Ludmilla Shechter is the third Eaton Fellow.

* In places where vegetation is scarce, particles in the top several millimeters of soil may be bound together by various microorganisms, forming a surface crust.

The ecological role of desert animals: IES animal ecologist Dr. Richard Ostfeld is concerned with how the behavior of burrowing invertebrates, for example isopods that are very similar to our pillbugs, and small mammals, including three species of gerbils and a desert porcupine, affects the establishment and growth of plants in the savanna ecosystem. Porcupines are particularly important because as they dig in sand and soil looking for roots and tubers to eat, they create pits. These pits, measuring up to 1 meter across, collect water and thereby help to preserve moisture in the savanna system. Also, by breaking up the soil crust, the porcupines reduce runoff and help plants get established in the softer sand or soil beneath. (Desert porcupines, except for a lighter color and fewer and heavier spines, look very much like those of North America.)

Calendar

CONTINUING EDUCATION

Catalogues listing **winter and spring semester** classes, workshops and excursions are available from the Gifford House. Highlights include:

Mar. 5: **Designing a Flower Garden** (workshop)

Mar. 9: **Philadelphia Flower Show** (excursion)

Mar. 12 & 13: **Pen and Ink I**

Mar. 19: **Raised Bed Vegetable Gardening**

Mar. 19: **Ecological Landscape Assessment** (workshop)

Mar. 19: **Pruning Trees & Shrubs** (field course)

Mar. 22 & 29: **Landscape Design with Native Herbs**

Mar. 26: **Ecological Alternatives to Lawns**

Apr. 9 - May 14 (6 sessions): **Floral Design** (crafts course)

Apr. 23: **Wetlands: Ecology, Creation and Restoration** (workshop)

Apr. 23: **Spring Wildflower Ogle** (excursion)

The IES Continuing Education Program office has a new telephone number. Call 914/677-9643 for information on certificate programs or individual offerings, or to register.

SUNDAY ECOLOGY PROGRAMS

Free public programs are held on the first and third Sunday of each month, except over holiday weekends. Programs begin at 2 p.m. at the Gifford House on Route 44A unless otherwise noted below*. Last-minute schedule changes are sometimes unavoidable, so call 914/677-5359 to confirm the day's topic.

Mar. 6: **The Things Plants Do!**, a demonstration at the IES Greenhouse*, by Ana Ruesink and Jill Cadwallader

Mar. 20: **Coral Reefs of the Bay Islands of Honduras**, a slide presentation by Dr. Nina Caraco

Apr. 17: **Super Soil ... an underworld exploration for kids and their escorts**, a walk and activity led by Kass Hogan

For general information, call the IES Education Program Office at the Gifford House Visitor and Education Center: 914/677-5359 weekdays from 8:30 - 4:30.

Sunday Ecology Programs, continued

May 1: **Monitoring the Health of the Forest**, a walk led by Dr. Gary Lovett

** In case of poor weather, call 677-5358 after 1 p.m. to learn the status of the day's program. For outdoor programs, wear long pants tucked into socks and sturdy waterproof shoes.*

IES SEMINARS

The Institute's program of **scientific seminars** features presentations by visiting scientists. These free seminars are held each Friday at 3:30 p.m. in the Plant Science Building. Last-minute schedule changes are sometimes unavoidable, so call 914/677-5343 to confirm the day's topic.

Mar. 4: **Subsurface Microbial Ecology**,

Dr. William C. Ghiorse, Cornell Univ.

Mar. 11: **Effects of *Chaoborus* and Fish Odors on *Daphnia* Swimming Behavior: Implications for Diel Vertical Migration and the Predator-Prey Interaction**, Dr. Stanley Dodson, Univ. of Wisconsin

Mar. 18: **Modeling Hydrologic and Biogeochemical Processes in Alpine and Subalpine Environments**, Dr. Jill Baron, Colorado State Univ.

Mar. 25: **Structure and Function of Pelagic Ecosystems: Patterns, Processes, Mechanisms**, Dr. Asit Mazumder, Univ. of Montreal

Apr. 8: **Artificial Boundaries in Ecology: Cascading Effects of a Molecular Interaction from the Individual to the Landscape Level of Organization**, Dr. Mark Hunter, Univ. Laval, Quebec

Apr. 15: **Grazing, Cultivation and Recovery of Ecosystems in the Central Grasslands of the U.S.: Implications for Soil Organic Matter at Local and Regional Scales**, Dr. Ingrid C. Burke, Colorado State Univ.

Apr. 22: **Masting Behavior in Oaks**, Dr. Victoria L. Sork, Univ. of Missouri

GREENHOUSE

The IES greenhouse is a year-round tropical plant paradise as well as a site for controlled environmental research. The greenhouse is open until 4:00 p.m. daily except public holidays. Admission is by free permit from the Gifford House.

GIFT AND PLANT SHOP

Senior Citizens Days: On Wednesdays, senior citizens receive a 10% discount (except sale items).

Put it on your calendar: Annual Perennial Sale, Friday - Sunday, May 20 - 22.

HOURS

(Winter hours: **October 1 - April 30;**
closed on public holidays)

Public attractions are open Mon. - Sat., 9 a.m. - 4 p.m. & Sun. 1 - 4 p.m.; trails and roadways are closed when snow-covered.

The **Gift and Plant Shop** is open Mon. - Sat., 11 a.m. - 4 p.m. & Sun. 1 - 4 p.m. (The shop is closed weekdays from 1 - 1:30 p.m.)

** All visitors must pick up a free permit at the Gifford House Visitor and Education Center on Route 44A for access to IES public attractions. Permits are available until 3:00 p.m. daily.*

MEMBERSHIP

Become a member of the Institute of Ecosystem Studies. Benefits include a member's rate for IES courses and excursions, a 10% discount on Gift Shop purchases, a free subscription to the IES Newsletter, and participation in a reciprocal admissions program, with benefits at over 100 nature centers, forest preserves, gardens and conservatories in the U.S. and Canada. Individual membership is \$30; family membership is \$40. For information on memberships, call Janice Claiborne at 914/677-5343.

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